Dynamic Evolution of the Human Knowledge System in a Textbook(International & Interdisciplinary Symposium on What is Evolution? Bicentennial of Charles Darwin's Birth)

AUTHOR(S):

Han, Seung Kee

CITATION:

Han, Seung Kee. Dynamic Evolution of the Human Knowledge System in a Textbook(International & Interdisciplinary Symposium on What is Evolution? Bicentennial of Charles Darwin's Birth). 物性研究 2010, 94(1): 128-129

ISSUE DATE:

2010-04-05

URL:

http://hdl.handle.net/2433/169272

Oct. 17 (Sat.) 14:00-14:30

Emergent Complexity in Speech Acquisition: Applications to Evolution of the Speech Capacity.

Marta Ortega-Llebaria, Barbara Davis and Jie Yang
University of Texas at Austin

The acquisition of phonological complexity in young children enables a short-time scale view of the long-time scale evolutionary process that has concluded in contemporary human language. The classic Chomskian perspective proposes that linguistic form originates in the human mind and is available to the infant prior to use, making the descent-with-modification approach untenable. In contrast, emergence proposals (e. g. Davis & Bedore, in preparation, Tomasello, 2003) understand the acquisition of human language to be an instance of emergent complexity. In particular, phonological complexity is seen as arising from the interaction of child-intrinsic capacities supported by adult input to serve adaptive functions within social interactions. Within an emergence perspective, the Frame-Content hypothesis (F/C; MacNeilage & Davis, 1990) suggests that biomechanical constraints underlie observable output patterns in infant babbling and are retained in languages. These constraints were also found in a putative corpora of early hominid speakers (MacNeilage & Davis, 2000). We will present results on development of pitch patterns in tone and intonational languages to extend the F/C principles to consider emergence of the prosodic component of phonological form.

Oct. 17 (Sat.) 14:30-15:00

Dynamic Evolution of the Human Knowledge System in a Textbook

Seung Kee Han
Department of Physics, Chungbuk National University.

The human knowledge system in a textbook is a dynamically evolving complex system. A large number of new concepts are presented systematically to maximize the cooperative learning effect through mutual association. In this study, we analyze the dynamic organization of a textbook network, where a node corresponds to a physics terminology and a link between two nodes implies the co-occurrence of two terms in a sentence. We show that the growth of the scale

free network of the textbook is characterized by the formation of the long-lasting communities, which plays a crucial role in enhancing the learning efficiency. The results are compared with those of random textbooks and also the dictionary. Finally we present a simple mathematical model of textbook growth that produces a long-lasting giant community structure.

Oct. 17 (Sat.) 15:00-15:30

The Descent of Science: How Quantum Mechanics is Shedding Light on the Interaction of Light and Matter.

Cynthia Trevisan

The California Maritime Academy, California State University

Darwin's original postulate states that each species of life descended from a primordial form through the process he called natural selection. As with life, scientific ideas evolved over time to forge new scientific theories. Many theories were superseded. Examples include the theory of "luminiferous aether", the "plum pudding" and other early models of the atom. Scientific ideas continue to evolve to explain and predict the behavior of nature. Only theories that are not disproved by the empirical method survive, to point the way to descendant theories that can enhance our understanding of the world and predict new phenomena.

I will give a brief introduction to one of the theories that derived from early atomic models, Quantum Mechanics, the theory that helps us understand the behavior of matter and light at a small scale. I will then show how experiments and calculations that use the principles of quantum mechanics, performed by the Atomic, Molecular and Optical Sciences (AMOS) Group at the Lawrence Berkeley National Laboratory, are shedding light on the mechanisms by which molecules dissociate into fragments after absorption of an X-ray photon. I will describe surprising findings in the particular case of carbon dioxide, and how a detailed study of this case led to a deeper understanding of the interaction between light and matter. Finally, I will discuss the following questions: Are the measurements and computations done by the AMOS Group leading to the extinction of a theory that has been used for decades in molecular spectroscopy? Will a certain kind of experiments become extinct as a consequence of these findings?